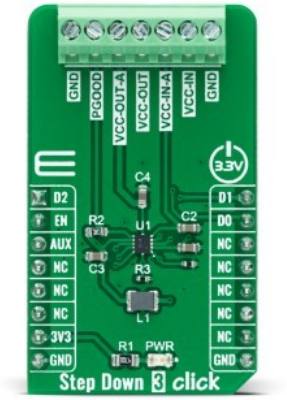
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Step Down 3 Click





PID: MIKROE-5169

Step Down 3 Click is a compact add-on board that steps down the voltage from its input to its output. This board features the ST1PS03, a nano-quiescent miniaturized synchronous step-down converter with a load switch from STMicroelectronics. The ST1PS03 can provide up to 400mA output current with an input voltage ranging from 1.8V to 5.5V, specifically designed for applications where high efficiency is crucial. It also embeds a controlled switch accessible from auxiliary channel input to supply a subsystem, output voltage from 1.6V to 3.3V set using three digital control inputs, and a Power Good signal to indicate stabilized output voltages. This Click board™ is suitable for power conversion solutions in personal tracking monitors, energy harvesting, industrial sensors, portable low power devices, and more.

Step Down 3 Click is supported by a mikroSDK compliant library, which includes functions that simplify software development. This Click board™ comes as a fully tested product, ready to be used on a system equipped with the mikroBUS™ socket.

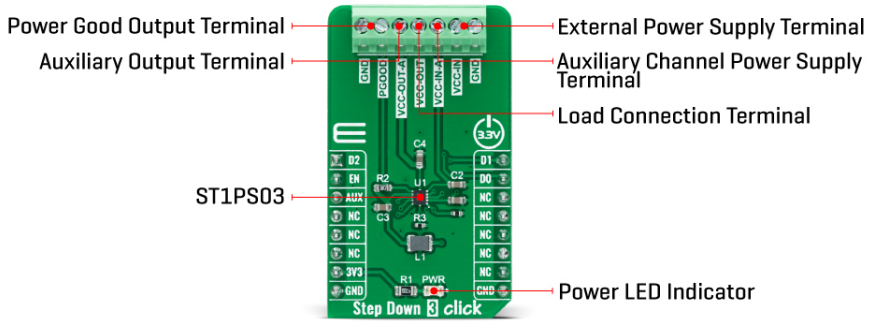
How does it work?

Step Down 3 Click as its foundation uses the ST1PS03, an ultra-low quiescent new generation buck converter from STMicroelectronics. The ST1PS03 targets a small quiescent current consumption, and it guarantees high-efficiency operation even down to a few microampere loads. It can provide up to 400mA output current with an output voltage from 1.6V to 3.3V on the VCC-OUT terminal, selectable using three digital control pins routed to the INT, PWM, and AN pins of the mikroBUS™ socket, and an input voltage ranging from 1.8V to 5.5V appliable on VCC-IN terminal.

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The ST1PS03 is based on a hysteretic comparator that senses the coil ripple current, held constant in all operation modes. The ST1PS03 changes the switching frequency depending on the input supply voltage to maintain a continuous ripple current on the selected coil. It has a seamless transition between PFM (pulse frequency modulation) and PWM (pulse width modulation) mode with low ripple and good load transient response. During PWM mode (heavy load), the device operates in continuous conduction up to 400mA and a switching frequency of 2MHz maximum.

The device enters 100% duty cycle operation if the input voltage comes close to the selected output voltage. The regulator is turned OFF during this mode, and the output pin is directly connected to the input pin through the internal high-side MOSFET. Once the input voltage exceeds the 100% duty cycle, the device restarts to switch and regulates the output voltage again. This Click board™ also has a Power Good comparator which monitors the selected output voltage and provides information on the appropriate PGOOD terminal.

Step Down 3 Click communicates with MCU using several GPIO pins. The AUX pin routed to the CS pin of the mikroBUS™ socket controls the auxiliary output terminal labeled as VCC-OUT-A. It provides the same regulated voltage level as VCC-IN-a input voltage, less drop on the load switch circuitry when the AUX pin and EN pin, routed to the RST pin of the mikroBUS™ socket, are tied high. The VCC-OUT-A terminal allows connecting/disconnecting the other system load to the output of the ST1PS03.

This Click board™ can be operated only with a 3.3V logic voltage level. The board must perform appropriate logic voltage level conversion before using MCUs with different logic levels. However, the Click board™ comes equipped with a library containing functions and an example code that can be used, as a reference, for further development.

Specifications

Type	Buck
Applications	Can be used for power conversion solutions in personal tracking monitors, energy harvesting, industrial sensors, portable low power devices, and more
On-board modules	ST1PS03 - ultra-low quiescent new generation buck converter from STMicroelectronics

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Key Features	Nano-quiescent synchronous step-down converter, output voltage selection, Power Good indicator, load switch controlled by auxiliary channel, undervoltage lockout, low power consumption, high efficiency, and more
Interface	GPIO
ClickID	No
Compatibility	mikroBUS™
Click board size	M (42.9 x 25.4 mm)
Input Voltage	3.3V

Pinout diagram

This table shows how the pinout on Step Down 3 Click corresponds to the pinout on the mikroBUS™ socket (the latter shown in the two middle columns).

Notes	Pin	mikroBUS				Pin	Notes
Output Voltage Selection Pin 2	**D2**	1	AN	PWM	16	**D1**	Output Voltage Selection Pin 1
Device Enable	**EN**	2	RST	INT	15	**D0**	Output Voltage Selection Pin 0
Auxiliary	**AUX**	3	CS	RX	14	NC	
	NC	4	SCK	TX	13	NC	
	NC	5	MISO	SCL	12	NC	
	NC	6	MOSI	SDA	11	NC	
Power Supply	**3.3V**	7	3.3V	5V	10	NC	
Ground	**GND**	8	GND	GND	9	**GND**	Ground

Onboard settings and indicators

Label	Name	Default	Description
LD1	PWR	-	Power LED Indicator

Step Down 3 Click electrical specifications

Description	Min	Typ	Max	Unit
Supply Voltage VCC	-	3.3	-	V
External Supply Voltage VCC-IN	1.8	-	5.5	V
Output Voltage VCC-OUT	1.6	-	3.3	V
Auxiliary Input Voltage VCC-IN-A	0	-	5.5	V
Auxiliary Output Current VCC-OUT-A	-	-	100	mA
Switching Frequency	-	-	2	MHz
Operating Temperature Range	-40	+25	+120	°C

Software Support

We provide a library for the Step Down 3 Click as well as a demo application (example), developed using MikroElektronika compilers. The demo can run on all the main MikroElektronika development boards.

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Package can be downloaded/installed directly from NECTO Studio Package Manager(recommended way), downloaded from our LibStock™ or found on Mikroe github account.

Library Description

This library contains API for Step Down 3 Click driver.

Key functions

- stepdown3_enable_device This function enables the auxiliary output (VOUT_AUX) by setting the AUX pin to HIGH logic state.
- stepdown3_enable_aux_output This function disables the auxiliary output (VOUT_AUX) by setting the AUX pin to LOW logic state.
- stepdown3_set_output_voltage This function sets the output voltage by setting the D2, D1, and D0 pins to a desired state.

Example Description

This example demonstrates the use of Step Down 3 Click board™ by iterating through the entire output voltage range.

The full application code, and ready to use projects can be installed directly from NECTO Studio Package Manager(recommended way), downloaded from our LibStock™ or found on Mikroe github account.

Other Mikroe Libraries used in the example:

- MikroSDK.Board
- MikroSDK.Log
- Click.StepDown3

Additional notes and informations

Depending on the development board you are using, you may need USB UART click, USB UART 2 Click or RS232 Click to connect to your PC, for development systems with no UART to USB interface available on the board. UART terminal is available in all MikroElektronika compilers.

mikroSDK

This Click board™ is supported with mikroSDK - MikroElektronika Software Development Kit. To ensure proper operation of mikroSDK compliant Click board™ demo applications, mikroSDK should be downloaded from the LibStock and installed for the compiler you are using.

For more information about mikroSDK, visit the official page.

Resources

mikroBUS™

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mikroSDK

Click board™ Catalog

Click Boards™

Downloads

Step Down 3 click example on Libstock

ST1PS03 datasheet

Step Down 3 click 2D and 3D files

Step Down 3 click schematic

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